

TITLE: Liquid water in the extremely shallow Martian subsurface.

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Availability of liquid water is one of the major constraints for the potential Martian biosphere. Although liquid water is unstable on the surface of Mars due to low atmospheric pressures, it has been suggested that liquid films of water could be present in the Martian soil.

Here we explored a possibility of the liquid water formation in the extremely shallow (1-3 cm) subsurface layer under low atmospheric pressures (0.1-10 mbar) and low ("Martian") surface temperatures (~ -50 C- 0 C). We used a new Goddard Martian simulation chamber to demonstrate that even in the clean frozen soil with temperatures as low as -25C the amount of mobile water can reach several percents. We also showed that during brief periods of simulated daylight warming the shallow subsurface ice sublimates, the water vapor diffuses through porous surface layer of soil temporarily producing supersaturated conditions in the soil, which leads to the formation of additional liquid water. Our results suggest that despite cold temperatures and low atmospheric pressures, Martian soil just several cm below the surface can be habitable.
